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Late Blight of Tomatoes



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Importance of Late Blight

In 1946 late blight of tomatoes caused more damage than it had caused in any previous year. Until then it was almost unknown in many tomato-growing sections.

Many growers had had no experience with this disease; and so they were not prepared to use control measures that would have prevented much of the loss. The disease had caused some losses in the Northeastern States and in parts of the Middle Atlantic, Gulf, and Southeastern States and occasional damage in Texas and in certain localities on the Pacific coast. In most of these sections, however, it had not caused severe losses every year. In other tomato-growing sections late blight had rarely appeared even in a mild form until 1945, when it caused rather serious losses in some of the Central States.

Favored by unusually long periods of cool, wet weather, late blight developed early in the 1946 season in the States along the Atlantic seaboard. In many of these States a quarter to a half of the crop was destroyed. The disease was also present in the Middle West in early summer; but weather conditions in July and August did not favor its spread, and losses were comparatively light.

Symptoms of Late Blight

Here's how you can recognize late blight.

On leaves.—The first symptoms of late blight on the leaves are greenish-black water-soaked patches. These enlarge rapidly; soon they become dark brown, and the affected leaves wither. In damp weather the dark patches often have a white fungus growth on their under sides. The presence of this fungus will help to distinguish late blight from other leaf spots of tomato.

On stems.—Infected stems show brown water-soaked spots much like those on the leaves. These spots extend some distance up the stem. Such infections may kill young plants.

On fruits.—Tomato fruits may be attacked at any period of growth. The first signs of late blight rot are small, water-soaked blotches that usually appear on the upper part of the fruit. They may, however, appear elsewhere on its surface. The affected part of the fruit becomes brown, but remains firm; the infection extends a short distance into the flesh of the tomato. Such rotted spots enlarge rapidly. They are often slightly sunken at the margin where the decayed and healthy tissues meet.

Cause of Late Blight

Late blight of tomatoes is caused by a strain of the fungus that causes late blight of potatoes.

This fungus¹ lives on the plant. It kills the leaves and stems and causes decay of the fruit. In damp weather there is a growth of the fungus on the under sides of the leaves. There it produces great numbers of microscopic seedlike bodies called spores. These spores are splashed by rain or blown by wind to other plants. If moisture is present on such plants, the spores germinate and cause new infections.

Weather That Favors Late Blight

Spores of the late blight fungus germinate readily at temperatures of 40° to 70° F. if the plant is wet. At temperatures above 75° in dry weather the spores soon die. Thus blight spreads most rapidly during damp weather when temperatures do not rise much above 70°. Plants that make a heavy growth and are so crowded that they dry off slowly after rain or heavy dew suffer most. Under such conditions all the plants in a field may soon be blighted.

How Late Blight Gets Started

No matter what the weather is, late blight will not start in a field unless there is some source of the fungus. Apparently this fungus does not live over winter in the soil on dead plants. There are three important ways in which it may come into your field.

(1) *From potato plants infected with late blight.*—Late blight of tomatoes is caused by a strain of the fungus that causes late blight of potatoes. Potatoes can be infected by this strain from tomatoes; their diseased tubers then may carry the tomato strain. The common potato strain may also infect tomatoes. Any blighted potato plant, therefore, may be a source of spores that can start late blight in tomato fields nearby.

(2) *From wind-blown spores from blighted tomatoes in other fields.*—Spores of the late blight fungus can be carried by the wind for some distance. Thus there can be a gradual spread from one tomato field to another. Late blight often appears on early-market tomato crops in the South during the winter and early spring. It is possible that the disease may gradually work northward from field to field through movement of spores by the wind.

(3) *From the late blight fungus on seedlings.*—Infection may occur on seedlings grown in northern greenhouses in which late blight has occurred on older plants grown for hothouse-tomato production during the winter and early spring. Also, seed-

¹ *Phytophthora infestans*.

lings grown in the field in the South for shipment to northern growers may sometimes become infected with late blight before shipment.

How To Control Late Blight

Rotation.—It is best not to plant tomatoes in a field where a crop of potatoes has just been grown. If the potatoes had late blight, some of the diseased tubers might sprout in the soil and produce blighted volunteer plants. Then, the late blight fungus would be in the field at the beginning of the season and might infect the tomatoes you plant. As a matter of fact, it is also just as well not to plant tomatoes after potatoes or tomatoes, in order to reduce the number of other diseases.

Use of disease-free plants.—Naturally, you should plant only vigorous, stocky tomato plants that show no cankers or dark spots on the stems. If your plants were grown in another State, make certain that they are State-certified.

Spacing.—Give tomato plants plenty of space. When planted too close together, they dry out slowly after rains or heavy dews; and so they are more likely to be attacked by late blight. In commercial fields rows should be far enough apart for effective spraying or dusting with machines. A spacing of 6 feet between rows, with 3 feet between plants in the row, is suggested; one of $5\frac{1}{2}$ by $3\frac{1}{2}$ feet may be used if preferred. With staked tomatoes and in the home garden closer spacing may be used.

Spraying and dusting.—It has been shown that late blight can be controlled by copper fungicides. The fixed coppers, such as copper oxychloride sulfate, tribasic copper sulfate, copper oxychloride, and cuprous oxide, give good results. Bordeaux mixture also is an effective fungicide but is more likely to injure the plants, especially early in the season. Blight can also be controlled by the use of disodium ethylene bisdithiocarbamate (Dithane D-14) with the addition of zinc sulfate and lime or by a new compound, zinc ethylene bisdithiocarbamate (Dithane Z-78, Parzate).

Another organic fungicide, zinc dimethyl dithiocarbamate (Zerlate, Zimate, Karbamwhite, or Methasan), seems to be equal to, or even superior to, copper fungicides for the control of some other leaf spots and anthracnose fruit rot of tomatoes; but it is *not* recommended for the control of late blight. If it is used during the early part of the season for the control of such diseases as early blight and anthracnose, it should be immediately replaced by copper fungicides or by Dithane D-14, Dithane Z-78, or Parzate if late blight threatens to appear.

How To Mix Sprays and Dusts

The fixed copper compounds are used on a basis that gives an equivalent of 2 pounds of metallic copper to 100 gallons of water. Thus, you would use 4 pounds of a compound containing 50 percent of actual copper and $2\frac{1}{2}$ pounds if the compound contains 80 percent of copper. Ordinarily, you will find that the manufacturer has indicated on the package the amount that should be used.

Bordeaux mixture is an excellent fungicide. It is more likely, however, to injure the plants than are the fixed copper compounds, especially during the early part of the season. The old standard formula is 8-8-100 (8 pounds of copper sulfate, 8 pounds of hydrated lime, and 100 gallons of water); but an 8-4-100 formula gives good results and is less likely to injure the plants. The 6-6-100 and 6-3-100 formulas are also used.

Bordeaux mixture may be prepared in small quantities for use in the home garden by using 4 ounces of copper sulfate, 2 ounces of hydrated lime, and 3 gallons of water. The copper sulfate is dissolved in 6 quarts of water in a wooden, glass, or earthenware vessel. The lime is made into a thin paste and enough more water is added to make 6 quarts. Then the two solutions are poured together while being stirred. Bordeaux mixture may also be purchased in powder form; to the powder water is added as directed by the manufacturer. A freshly made mixture gives best results.

Disodium ethylene bisdithiocarbamate (Dithane D-14) is a liquid that is used at the rate of 2 quarts to 100 gallons of water. After the Dithane D-14 and water are mixed, 1 pound of zinc sulfate is added to the solution; next, $\frac{1}{2}$ pound of hydrated lime is added; then, the spray is ready to use. Another similar fungicide, zinc ethylene bisdithiocarbamate (Dithane Z-78, Parzate), has recently been introduced. This compound is related to the reaction product of Dithane D-14 and zinc sulfate and has given good control of late blight. It does not require the addition of zinc sulfate or lime; it should be used as directed by the manufacturer. Supplies of this new material are likely to be limited in 1947.

Copper dusts are generally less effective than sprays, but they can be reasonably effective if thoroughly applied. A fixed copper dust containing 5 to 7 percent of actual copper should be used. Dusts usually can be purchased ready-prepared from dealers in agricultural supplies.

Fungicides should be purchased early in order to have them ready whenever late blight threatens.

How To Spray or Dust

In larger commercial fields power sprayers of the row type that deliver about 150 to 200 gallons per acre at 300 pounds' pressure are suggested. In emergencies, however, orchard sprayers have been used with good results. When plants are small, three nozzles may be used to the row; four are suggested for thorough coverage of large plants. Two of these four nozzles should be above the plants. When plants are dusted, 30 to 50 pounds of dust should be used per acre. It is best to dust tomatoes early in the morning or late in the day when there is no wind. Dew on the leaves is needed to help the dust stick. Dusting machines should be so adjusted as to deliver a steady and uniform cloud of dust.

In the home garden and small field plantations various smaller sprayers (knapsack, bucket-pump, barrel types) are satisfactory. Small puff-type dusters may be used for dusting, but a good rotary machine of the crank type is better.

When To Spray or Dust

Spraying or dusting should start about 30 days after the first cluster blooms unless blight threatens to appear earlier. The number of applications needed will depend on the weather and location; but at least four are needed unless the weather is very hot and dry for long periods. When late blight threatens, apply an effective fungicide at once. Sprays should be applied at intervals of about 8 to 10 days, depending on the weather; with dusts the intervals should be reduced to 5 to 7 days. Growers often stop spraying too soon. The late applications, right up into harvest, are often the most important. Sprays and dusts cannot cure your blighted plants: they merely protect the plants from infection by spores of the blight fungus. Always have your plants protected by the fungicide before rainy periods.

How To Obtain Additional Information

The recommendations for formulas, the methods of mixing fungicides, and the spraying and dusting schedules vary with the States. It is, therefore, desirable that you consult your county agent or your State agricultural college.

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